CIRCUIT BOARD MOUNTED ELECTRICAL CONNECTOR

Field of the Invention

This invention generally relates to the art of electrical connectors and, particularly, to an electrical connector for mounting on a circuit board.

Background of the Invention

There are a wide variety of electrical connectors which are designed for mounting on a printed circuit board. Such connectors typically include a dielectric or plastic housing which mounts a plurality of conductive or metal terminals. The terminals typically have contact portions at one end thereof for engaging the contacts of a complementary connecting device or mating electrical connector and solder tail portions at opposite ends thereof for connection, as by soldering, to circuit traces on the circuit board. The solder tails may be pin portions for insertion into appropriate holes in the circuit board or the solder tails may be flat portions for surface mounting on the circuit traces of the circuit board. The surface mounted solder tails typically are planar and are generally flush with a bottom mounting face of the connector housing. Circuit board mounted electrical connectors having terminals with flat surface-mounted solder tails also are used in a wide variety of electrical connectors ranging from battery connectors to memory card connectors.

Examples of some memory card connectors are shown in Chinese Patent No. 99125707 and in Taiwanese Patents Nos. 85205010 and 86212738. Such memory card connectors typically include a dielectric housing having a plurality of terminal-receiving passages which extend between a top mating face of the housing and a bottom board-mounting face of the housing, along with a plurality of conductive metal terminals mounted in the passages. The terminals are pushed into the passages from the bottom face of the housing. Each conductive terminal includes a base located in the passage, a solder tail extending from the base and a contact portion which extends from an opposite end of the base and expose at the top mating face of the housing for engaging the contacts of a memory card. The solder tails are soldered to circuit traces on a circuit board to which the connector is mounted.

Such prior art memory card connectors are represented by Figures 7 and 8 herein. As shown, the connector includes a dielectric housing, generally designated 10, which has a top mating face 10a and a bottom board-mounting face 10b. A plurality of terminal-receiving passages 12 extend between the faces. A plurality of conductive terminals, generally designated 14, are mounted in the passages. Each terminal includes a base 14a having outwardly projecting interference portions 14b establishing an interference fit with the housing. The terminals have flat solder tail portions 14c which are generally loosely disposed within slots 16 of the housing so that the flat solder tails are maintained generally flush with bottom mounting face 10b of the housing.

When solder tails 14c of terminals 14 are soldered to the circuit traces on a circuit board, considerable heat is generated and dielectric housing 10 normally heats up and can expand in various directions. Unfortunately, the metal terminals do not follow suit and do not change their shape to the same extent as the housing. With solder tails 14c being disposed loosely within slots 16 at the bottom mounting face of the housing, problems occur because of the different coefficients of heating expansion of the plastic housing and the metal terminals, and the solder tails often become separated from the housing. This imposes a negative effect on the performance of the memory card connector. The present invention is directed to solving these problems.

Summary of the Invention

An object, therefore, of the invention is to provide a new and improved circuit board mounted electrical connector of the character described.

In the exemplary embodiment of the invention, the connector includes a dielectric housing having a top mating face, a bottom face for mounting on a circuit board and a plurality of terminal-receiving passages extending between the faces. A plurality of conductive terminals are mounted on the housing and each terminal includes a base mounted in a respective one of the passages. A solder tail extends from one end of the base for connection to an appropriate circuit trace on the circuit board. A contact portion extends from an opposite end of the base and is exposed at the mating face of the housing for engaging an appropriate contact of a complementary connecting device. The housing includes a plurality of holding slots at the bottom face thereof for receiving the solder tails of the terminals with interference fits to rigidly fix the solder tails to the housing.

According to one aspect of the invention, each of the holding slots at the bottom face of the housing includes at least one inner side wall having an inwardly projecting interference member for engaging a side edge of the respective solder tail in the slot. As disclosed herein, each holding slot has a pair of opposite inner side walls having inwardly projecting, opposing interference members for engaging opposite side edges of the respective solder tail. The interference members have rounded or semi-cylindrical engaging surfaces for engaging the side edges of the respective solder tail.

According to another aspect of the invention, the conductive terminals are stamped and formed of sheet metal material. Each terminal is generally U-shaped to define a pair of legs joined by a bent portion of the terminal. One leg defines the base of the terminal and the opposite leg is bent back over the base and defines a spring arm having the contact portion of the terminal thereon. The solder tail of the U-shaped terminal is formed at a distal end of the one leg which defines the base. The contact portion of each U-shaped terminal is formed as a contact dome projecting from one side of the opposite leg which defines the spring arm. Complementary interengaging stop means are provided between the housing and a distal end of the spring arm to limit the degree of flexing of the arm.

Other features of the invention include the housing being molded of plastic material and including cut-out areas between adjacent slots to increase the elasticity of the side walls of the slots. Each holding slot has an elevated platform on which a respective solder tail is positioned to maintain the solder tail generally flush with the bottom face of the

housing. The base of each terminal includes a pair of interference portions in the form of wings projecting from opposite edges of the base for engaging opposite side walls of a respective terminal-receiving passage with an interference fit.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIGURE 1 is a top perspective view of a board-mounted electrical connector incorporating the concepts of the invention;

FIGURE 2 is a vertical section taken generally along line 2-2 of Figure 1;

FIGURE 3 is an exploded perspective view of the connector prior to inserting the terminals into the passages of the housing;

FIGURE 4 is a bottom perspective view of the connector, with one of the terminals removed to facilitate the illustration;

FIGURE 5 is a fragmented, enlarged perspective view of the top corner of the housing as viewed in Figure 4;

FIGURE 6 is an enlarged, bottom perspective view of one of the terminals; and

FIGURES 7 and 8 are perspective views of the prior art connector described in the "Background", above.

Detailed Description of the Preferred Embodiment

Referring to the drawings in greater detail, and first to Figures 1-4, the invention is incorporated in a memory card connector, generally designated 20, which includes a dielectric housing, generally designated 22, having a top mating face 24, a bottom board mounting face 26 for mounting on a circuit board and a plurality of terminal-receiving passages, generally designated 28, extending between the faces. A plurality of conductive terminals, generally designated 30, are mounted on the housing within passages 28. The housing is fabricated of insulating material such as molded plastic or the like. The terminals are stamped and formed of conductive sheet metal material.

Before proceeding further with a description of the invention, it should be understood that such terms as "top", "bottom", "vertical", "horizontal" and the like are used herein and in the claims hereof to provide a clear and concise understanding of the invention as viewed in the drawings. Such terms are not in any way used as being limiting in scope, because the connector obviously can be fabricated and used in omni-directional orientations. In addition, while the invention is shown and described herein in conjunction with a memory card connector, the invention is equally applicable for incorporation in a variety of circuit board mounted electrical connectors, such as battery connectors or the like.

With those understandings, reference now will be made to Figures 2, 3 and 6 where the terminals will be described. As shown, each terminal 30 is generally U-shaped to define a pair of legs 32 and 34 joined by a bent portion 36. One leg 32 defines a planar or flat base which is mounted in a respective one of the terminal-receiving passages 28 of the housing. The opposite leg 34 defines a spring arm which is bent back over base 32 and includes an upwardly projecting, dome-shaped contact portion 38 for engaging an appropriate contact of a memory card. As seen clearly in Figure 2, spring arm 34 is disposed within its respective passage 28, and the dome-shaped contact portion 38 extends through a hole 40 in top face 24 of housing 22. A flat or generally planar solder tail 42 is formed at the distal end of base 32 and is formed out of the plane of the base so as to be offset downwardly therefrom. A stop rod 44 is stamped and formed at the distal end of spring arm 34. A pair of interference portions in the form of a pair of wings 46 project outwardly from opposite edges of base 32. Finally, a pair of mounting posts 48 project outwardly and upwardly from opposite edges of base 32 toward spring arm 34. The mounting posts have teeth 48a stamped at opposite edges thereof.

Referring to Figures 4 and 5, the bottom of housing 22 has a pair of mounting holes 50 at opposite sides of each terminal-receiving passage 28 for receiving toothed mounting posts 48 of a respective one of the terminals 30. A holding slot 52 is formed in bottom face 26 of the housing at an edge thereof for receiving solder tail 42 of the terminal. The solder tail rests on an elevated platform 54 in the center of the holding slot to maintain the flat solder tail flush with bottom face 26 of the housing. Slot 52 has a pair of inner side walls 56, and an interference member 58 projects inwardly from each side wall. The interference members have inwardly facing rounded or semi-cylindrical engaging surfaces. The housing has a cut-out area 60 between each adjacent pair of holding slots 52. The cut-out areas increase the elasticity of side walls 56 which define slots 52. Finally, a pair of stop surfaces 62 are formed at opposite sides of each passage 28 closer to top mating face 24 of the housing than bottom face 26 thereof, for engagement by opposite ends of stop rod 44 (Fig. 6) of the respective terminal.

The assembly of terminals 30 into housing 22 of connector 20 and the functionality of the assembly now will be described. Terminals 30 are inserted into terminal-receiving passages 28 through bottom face 26 of housing 22 in the direction of arrows "A" in Figures 2 and 3. During insertion, mounting posts 48 (Fig. 6) of the terminals are inserted into mounting holes 50 (Fig. 5) at the bottom of the housing as teeth 48a of the mounting posts bite into the plastic material of the housing within the mounting holes.

When the terminals are fully inserted as shown in Figure 4, interference wings 46 at opposite edges of bases 32 of the terminals engage the opposite side walls of the respective passage 28 with an interference fit. In addition, solder tails 32 of the terminals also are engaged within holding slots 52 of the housing with interference fits to rigidly fix the solder tails to the housing. Therefore, when the solder tails are soldered to the circuit traces on the circuit board and heat is generated, the rigidly fixed solder tails do not become disengaged from the housing as the housing might deform in response to the heat generated by the soldering process.

In essence, each solder tail 42 is rigidly fixed between the semi-cylindrical engaging surfaces of interference members 58 which project inwardly from side walls 56 of the respective holding slot 52. These positive point-like engagements effectively grip the solder tail which is in contrast to the loose fit of the solder tails within slots 16 of the prior art in Figures 7 and 8. Still further, cut-out areas 60 provide increased elasticity for side walls 56 so that they can deform slightly and react inwardly when the solder tails are

inserted to further enhance the grippability of interference members 58 on the side edges of the solder tails.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.